

Amendments to the claims:

1. (currently amended) A guided wave radar transmitter comprising:

2 a probe defining a transmission line and including a ~~relatively low impedance change~~
target marker above an expected sensing region of the probe, the target marker having a smaller
4 impedance change on the transmission line than impedance change of a material being sensed;

a pulse circuit connected to the probe for generating pulses on the transmission line
6 and receiving a reflected signal from the transmission line, the reflected signal selectively including
a target pulse representing the target marker and a level pulse representing material along length of
8 the probe; and

a controller operatively connected to the pulse circuit, the controller normally
10 operating at a ~~relatively low~~ first select gain to determine a level time to the level pulse to determine
material level, and periodically operating at a ~~relatively high~~ second select gain to determine a target
12 time to the target pulse, the second select gain being higher than the first select gain, the target time
being used to compensate the level time for properties of vapor above the material level.

2. (original) The guided wave radar transmitter of claim 1 wherein the probe
2 comprises a probe shaft and the target marker comprises a sleeve secured to the probe shaft.

3. (original) The guided wave radar transmitter of claim 1 wherein the controller
2 stores a calibrated target time and compares the determined target time to the calibrated target time
to compensate the level time for properties of vapor above the material level.

4. (original) The guided wave radar transmitter of claim 1 wherein the controller
2 stores a calibrated target time and determines a ratio of calibrated target time to the determined target
time to compensate the level time for properties of vapor above the material level.

5. (original) The guided wave radar transmitter of claim 4 wherein the ratio is used
2 to determine approximate temperature and the controller adjusts time of a fiducial pulse responsive
to the determined approximate temperature.

6. (currently amended) The guided wave radar transmitter of claim 1 wherein the
2 pulse circuit comprises a constant fraction discriminator for determining pulse times and the constant
fraction discriminator is disabled when the controller operates at the ~~relatively high~~ second select
4 gain.

7. (currently amended) The guided wave radar transmitter of claim 1 wherein the
2 controller comprises an automatic gain control of the ~~relatively high~~ second select gain.

8. (currently amended) The guided wave radar transmitter of claim 7 wherein the
2 automatic gain control selectively increases or decreases the ~~relatively high~~ second select gain to
ensure that the target pulse is sensed.

9. (currently amended) A time domain reflectometry measurement instrument

comprising:

a probe defining a transmission line and including a reference marker proximate a top end of the probe and a ~~relatively low impedance change~~ target marker above an expected sensing region of the probe, the target marker having a smaller impedance change on the transmission line than impedance change of a material being sensed;

a pulse circuit connected to the probe for generating pulses on the transmission line and receiving a reflected signal from the transmission line, the reflected signal selectively including a fiducial pulse representing the reference marker, a target pulse representing the target marker and a level pulse representing material along length of the probe; and

a time sampling circuit connected to the pulse circuit for developing a time representation of the reflected signal;

a controller operatively connected to the pulse circuit and the time sampling circuit, the controller comprising measurement means operating at a ~~relatively low~~ first select gain for determining a level time between the fiducial pulse and the level pulse to determine material level, and target means operating at a ~~relatively high~~ second select gain to determine a target time between the fiducial pulse and the target pulse, the second select gain being higher than the first select gain, the controller selectively operating either the measurement means or the target means, the target time being used to compensate the level time for properties of vapor above the material level.

10. (original) The time domain reflectometry measurement instrument of claim 9
2 wherein the controller normally operates the measurement means and periodically operates the target
means.

11. (original) The time domain reflectometry measurement instrument of claim 9
2 wherein the probe comprises a probe shaft and the target marker comprises a sleeve secured to the
probe shaft.

12. (original) The time domain reflectometry measurement instrument of claim 9
2 wherein the controller stores a calibrated target time and the target means compares the determined
target time to the calibrated target time to compensate the level time for properties of vapor above
4 the material level.

13. (original) The time domain reflectometry measurement instrument of claim 9
2 wherein the controller stores a calibrated target time and the target means determines a ratio of
calibrated target time to the determined target time to compensate the level time for properties of
4 vapor above the material level.

14. (original) The time domain reflectometry measurement instrument of claim 13
2 wherein the ratio is used to determine approximate temperature and the controller adjusts time of the
fiducial pulse responsive to the determined approximate temperature.

15. (original) The time domain reflectometry measurement instrument of claim 9
2 wherein the pulse circuit comprises a constant fraction discriminator for determining pulse times and
the constant fraction discriminator is disabled when the controller operates the target means.

16. (currently amended) The time domain reflectometry measurement of claim 9
2 wherein the controller comprises an automatic gain control of the ~~relatively high~~ second select gain.

17. The time domain reflectometry measurement instrument of claim 16
4 wherein the automatic gain control selectively increases or decreases the ~~relatively high~~ second select
gain to ensure that the target pulse is sensed.

18. (currently amended) A guided wave radar transmitter comprising:

2 a probe defining a transmission line and including a reference marker proximate a top
end of the probe and a ~~relatively low impedance change~~ target marker above an expected sensing
4 region of the probe, the target marker having a smaller impedance change on the transmission line
than impedance change of a material being sensed;

6 a pulse circuit connected to the probe for generating pulses on the transmission line
and receiving a reflected signal from the transmission line, the reflected signal selectively including
8 a fiducial pulse representing the reference marker, a target pulse representing the target marker and
a level pulse representing material along length of the probe; and

10 a controller operatively connected to the pulse circuit, the controller normally
operating at a ~~relatively low~~ first select gain to determine a level time between the fiducial pulse and
12 the level pulse to determine material level based on the level time, and periodically operating at a
~~relatively high~~ second select gain to determine a target time between the fiducial pulse and the target
14 pulse, the second select gain being higher than the first select gain, and comparing the determined
target time to a calibrated target time, representing propagation through air, to determine velocity
16 compensation amount, the velocity compensation amount being used to compensate the level time
for properties of vapor above the material level.

19. (currently amended) A guided wave radar transmitter of claim 18 further
2 comprising a time sampling circuit connected to the pulse circuit and operatively ~~associate~~ associated
with the controller for developing a time representation of the reflected signal.

20. (original) The guided wave radar transmitter of claim 18 wherein the probe
2 comprises a probe shaft and the target marker comprises a sleeve secured to the probe shaft.

21. (original) The guided wave radar transmitter of claim 18 wherein the controller
2 stores a calibrated target time and compares the determined target time to the calibrated target time
to compensate the level time for properties of vapor above the material level.

22. (original) The guided wave radar transmitter of claim 18 wherein the controller
2 stores a calibrated target time and determines a ratio of calibrated target time to the determined target
time to compensate the level time for properties of vapor above the material level.

23. (original) The guided wave radar transmitter of claim 22 wherein the ratio is
2 used to determine approximate temperature and the controller adjusts time of the fiducial pulse
responsive to the determined approximate temperature.

24. (original) The guided wave radar transmitter of claim 18 wherein the pulse
2 circuit comprises a constant fraction discriminator for determining pulse times and the constant
fraction discriminator is disabled when the controller operates at the relatively high gain.

25. (currently amended) The guided wave radar transmitter of claim 18 wherein the
2 controller comprises an automatic gain control of the ~~relatively high~~ second select gain.

26. (currently amended) The guided wave radar transmitter of claim 25 wherein the
2 automatic gain control selectively increases or decreases the ~~relatively high~~ second select gain to
ensure that the target pulse is sensed.